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At-School Substance Use as a Marker for Serious Health Risks

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Abstract

Objectives—At-school substance use is associated with increased rates of violence and delinquency. However, whether at-school substance use is a useful marker for other serious health risks and whether this association varies by gender or substance is still unclear.

Methods—We analyzed data from the national 2011 Youth Risk Behaviors Survey of 15,698 9th-12th grade students. Multivariate regressions controlling for age and race evaluated whether at-school marijuana and alcohol users were more likely than out-of-school users to exhibit 9 serious health risks (exposure to intoxicated driving, fighting, carrying a weapon at school, substance use with intercourse, experiencing intimate partner violence, being forced to have intercourse, experiencing depression, suicidal ideation and attempting suicide). We included interaction terms to determine whether this association varied by gender or substance.

Results—At-school alcohol and marijuana use were both associated with increased odds of all 9 serious health risks. The association between at-school substance use and both fighting and being forced to have sex was higher for boys than for girls. Associations did not vary significantly by substance. Specificity of at-school substance use for serious health risks ranged from 0.93-0.96, and positive predictive values ranged from 0.23-0.69, well above the ranges for both out-of-school use and non-use.

Conclusions—Students found using alcohol or marijuana at school should be immediately and carefully screened for other serious health risks that pose significant present dangers, as this may represent a critical opportunity to identify troubled youth.

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Keywords

school health; alcohol use; marijuana use; gender

Introduction

Substance use on school campus negatively impacts both the individual user and the larger school community.[1,2] Published reports of the 2011 Youth Risk Behavior Survey (YRBS) show that 4.9%, 5.1%, and 5.9% of students smoked cigarettes, drank alcohol, and used marijuana, respectively, on school property in the last 30 days.[3] Alarmingly, over 25% of students had been offered, sold or given an illegal drug on school property in the past 12 months[3] and up to 1/3 of students have seen classmates under the influence of either alcohol or drugs at school[4].

The majority of students report using drugs or alcohol off school property before using substances at school[5], and many of the same factors (such as older age, male gender and early onset of substance use) that predict higher rates of general adolescent substance use also predict at-school use[6]. Marijuana and alcohol are the most commonly used substances, both out-of school and at-school. Compared with out-of-school use, however, at-school substance use is associated with higher levels of violence (fighting, weapon carrying),[6-9] and more frequent overall substance use[8]. Additionally, among males who report having same-sex partners, at-school substance use is associated with having more sexual partners overall.[10] These findings suggest that at-school users might constitute a sizable population that exhibits high levels of other health risks.

Studies suggest that at-school alcohol users may have a particularly high-risk profile. While about half of adolescent marijuana users do so on school campus, less than one-fifth of adolescent drinkers report using alcohol at school.[6] Further, while at-school alcohol use is associated with fighting, vandalism, and rebelliousness,[9] the same has not been found for at-school marijuana use.[8,11]

Although teachers and school administrators are well aware of at-school substance use, most report uncertainty about how to respond to specific student drug and alcohol offenses.[12-15] There is a genuine lack of consensus on whether at-school substance use is primarily a disciplinary problem or a sign of serious health risks in need of supportive intervention. If at-school substance use is a relatively isolated event, mostly unrelated to a student's larger health issues, then it may be appropriate to respond to this offense similarly to how other school offenses are handled. However, if using alcohol and marijuana at school is a marker for more widespread problems, then addressing these factors might be an important aspect of prevention and treatment. The Problem Behavior Theory suggests that adolescent engaging in one high risk health behavior are at increased risk of engaging in other potentially dangerous behaviors.[16,17] Given the semi-public nature of at-school substance use, identifying whether at-school users are more likely to exhibit serious health risks, beyond substance use, can provide direction for parents, clinicians, and school officials confronted with a teen caught using substances on a school campus. Further, we know of no

studies that directly assess whether associations between at-school substance use and serious health risks vary by gender.

To address this knowledge gap, we determined whether students who use alcohol and marijuana at school are more likely than out-of-school users to exhibit serious health risks. In addition, we investigate whether these relationships differed by gender and by alcohol versus marijuana use.

Methods

We analyzed the 2011 Youth Risk Behavior Survey (YRBS), a national, representative anonymous survey of 15,698 9^{th}-12^{th} grade students attending schools throughout the United States. The YRBS has been administered through the Centers for Disease Control and Prevention (CDC) biennially since 1990 to assess and monitor the prevalence of behaviors that impact the health of youth throughout the country, specifically focusing on those that most contribute to morbidity, mortality, disability and social problems in youth and young adults. For the 2011 national survey, respondents were selected using a three-stage cluster sample design (to select counties, schools and classrooms), producing a representative sample of all US public, Catholic, and other private school students in grades 9 through 12, excluding Puerto Rico, the trust territories, and the Virgin Islands. A weighting factor was applied to each student record to adjust for nonresponse and the oversampling of Black and Latino students in the sample. The final sample for the 2011 YRBS consisted of 15698 students from 149 schools. The school response rate was 81% and the student response rate was 87% for an overall response rate of 71%. Local survey administrators followed parental permission procedures specific to the locality. In 2011 10% of schools used active permission and 90% used passive permission procedures. Surveys are administered in school, during a single class period. Students self-administer the survey, entering their answers on a computer-scanable booklet or answer sheet. Students absent on the day of survey administration are surveyed on alternative days. Data from the 2011 YRBS are publicly available through the CDC.[18]

Measures

Substance use—Students were asked on how many days during the previous month they had at least one drink of alcohol and had at least one drink of alcohol on school property. The seven response categories ranged from 0 days to all 30 days. Students were also asked how many times in the last 30 days they used marijuana and used marijuana on school property. The six response categories ranged from 0 times to 40 or more times. Any response greater than 0 days/times was considered a positive dichotomous measure of any use or at-school use. We chose to dichotomize measures of at-school substance use to make the analysis most relevant to adults confronted with a student caught using alcohol or marijuana at school. We also performed a sensitivity analysis using the frequency of at-school substance use as a predictor. Students who reported using alcohol or marijuana in the previous 30 days, but did not report any use at school, were considered out-of-school users of that substance.

Serious Health Risks—Serious risk behaviors were selected for their potential to pose immediate and grave harm to youth. All behaviors available in the YRBS survey with the potential to cause immediate and significant morbidity and mortality, excluding those that constitute only other forms of substance use, were included for analysis. Students were asked about their frequency of riding in a car or other vehicle driven by someone who had been drinking alcohol and driving a car or other vehicle when they had been drinking alcohol in the previous 30 days. A response greater than 0 times to either item was considered a positive response to a dichotomous measure of exposure to intoxicated driving. Additionally, students were asked on how many times in the previous 12 months they had been in a physical fight and how many days out of the last 30 days they carried a weapon, such as a gun, knife, or club, on school property. Responses greater than 0 times/days were considered positive dichotomous measures of fighting and at-school weapon carrying, respectively. A dichotomous measure of exposure to intimate partner violence was assessed by asking students whether their boyfriend or girlfriend ever hit, slapped, or physically hurt them on purpose during the past 12 months. Students were also asked whether they had been drinking alcohol or using drugs before the last time they had sexual intercourse and whether they had ever been physically forced to have sexual intercourse when they did not want to. To assess for symptoms of depression, students were asked whether, during the past 12 months, they ever felt so sad or hopeless almost every day for 2 weeks or more in a row that they stopped doing some usual activities. A positive response corresponds to a positive screen for depression risk using the PHQ-2 questionnaire, which has been validated as an initial screener in adolescent populations[19]. To assess for suicidal ideation, students were asked whether they seriously considered attempting suicide and whether they made a plan about how they would attempt suicide in the previous 12 months. A positive response to either item was considered a positive dichotomous measure of suicidal ideation. Finally, students were asked the number of times they actually attempted suicide in the previous 12 months. Any response greater than 0 times for suicide attempts was considered positive. For clarity of presentation, we dichotomized the outcomes for exposure to intoxicated driving, weapon carrying at school, fighting and attempting suicide. A sensitivity analysis using the frequency of each of these health risks yielded similar results.

Covariates—The list of candidate covariates in YRBS is limited. Covariates were selected for their potential to impact both school substance use and serious health risks. These included gender, race/ethnicity, and age.

Data Analysis

Analytic Sample—To determine whether at-school substance use is associated with serious health risks, when compared to out-of-school use, we restricted the main analysis to the 6,487 students who reported some alcohol or marijuana use in the previous 30 days. This represents 44.6% of the entire YRBS sample.

Analytic Approach—Logistic regressions were performed to determine whether students using alcohol or marijuana at-school had a higher odds of exhibiting serious health risks compared to students using alcohol or marijuana only out-of-school. To determine whether this association varied by gender, an interaction term of at-school substance use * male

gender was included in each model. To evaluate whether the type of substance used at school impacted this association, each of the serious health risks was regressed onto an indicator for at-school alcohol use, an indicator for at-school marijuana use and an interaction term for at-school alcohol use * at-school marijuana use.

Once again, the reference group consisted of student who only used substances out-of-school. All regressions were conducted using survey weights and control for gender, race/ethnicity, and age. Finally, to better illustrate the relationship between at-school substance use and serious health risks, we calculated the sensitivity, specificity, positive predictive value, and negative predictive value of any at-school alcohol or marijuana use for identifying each of the serious health risks. We compared these for students who do not use alcohol or marijuana, use alcohol or marijuana only out-of-school, and use both alcohol and marijuana at school.

Data was analyzed using STATA (version 12, StataCorp, College Station, TX). Missing data represented 5% or less for all variables in the analysis except having been drinking alcohol or using drugs before the last sexual intercourse, which was missing in 7.2%.

Results

Sample Demographics and Substance Use

Demographics of the overall YRBS sample have been reported previously.[3] When the analytic sample was restricted to students who reported some alcohol or marijuana use in the previous 30 days, the proportion of males, older adolescents, White and multiracial students increased (Table 1). While the majority of students did not use alcohol or marijuana in the past month, over 44% of students reported some use. About 40% of students use these substances only out-of-school with nearly 9% reporting use of alcohol or marijuana at school. Among at-school substance users, approximately 32% reported using only alcohol and over 24% reported using both marijuana and alcohol at school.

Relationship between At-School Substance Use and Serious Health Risks

Among those students reporting any alcohol or marijuana use in the previous 30 days, logistic regressions, revealed that, compared to out-of-school use, at-school alcohol or marijuana use is associated with increased odds of all 9 serious health risks (Table 2). In our sensitivity analyses, we found a strong dose response relationship for all variables. For example, there was a dose response relationship between the frequency of at-school substance use and each of the serious health risks. Additionally, at-school substance use was associated with more frequent exposure to intoxicated driving, more frequent weapon carrying, more frequent fighting and greater number of suicide attempts (results not shown) relative to out-of school substance use. We also evaluated whether the associations between at-school substance use and serious health risks varied by gender. The magnitude of the association between at-school substance use and fighting and being forced to have sex was significantly higher for boys compared to girls. No other significant gender differences were found.

We then evaluated whether the associations between at-school substance use and serious health risks varied by whether students reported using alcohol at school, marijuana at school, or both substances at school (Table 3). Compared to out-of-school use, alcohol and marijuana use at school were each individually associated with increased odds of exhibiting to all 9 serious health risks. Additionally, the magnitude of this association was similar for at-school alcohol use compared to at-school marijuana use. However, we found a significant interaction between at-school alcohol and at-school marijuana use and the associations with fighting and carrying a weapon at school. For these two outcomes, the magnitude of the association with at-school substance use was significantly increased for students reporting use of both marijuana and alcohol at school.

To better illustrate these associations, Table 4 describes the sensitivity, specificity and positive predictive value of any alcohol or marijuana use at school and using both alcohol and marijuana at school as a predictors of each serious risk behavior. For comparison, we also report these values for no alcohol or marijuana use and using alcohol or marijuana only outside of school. While the sensitivity of any at-school substance use is low (ranging from 0.15-0.41), the specificity is high (ranging from 0.93-0.96). The positive predictive value ranges between 0.23-0.69, in part due to differences in the prevalence of these health risks. For example, if a student is found using either alcohol or marijuana on school campus, there is a 64% chance they were in a car with an intoxicated driver in the last 30 days, a 46% chance they have a positive depression screen, a 25% chance they experienced intimate partner violence in the last 12 months and a 25% chance they attempted suicide in the last 12 months. The specificity (0.99-1.0) and positive predictive value (0.37-0.88) ranges are further increased for using both alcohol and marijuana at school.

Discussion

This study suggests that both boys and girls who use either alcohol or marijuana at school are significantly more likely to exhibit a disturbingly large variety of serious health risks, compared with out-of-school users. More importantly, the specific health issues associated with at-school substance use put students at considerable risk for immediate harm and might not otherwise come to the attention of a caring adult. Although previous studies suggest that at-school alcohol use might be a marker for more risky behavior than at-school marijuana use, our results suggest that use of either substance at school is associated with similar risks in terms of both the behavior profile and magnitude of the associations. Further, we find that at-school substance use has a high specificity for predicting serious health risks. The high prevalence of these behaviors among at-school users who may not seek out help from a caring adult on their own is particularly concerning. Together, these results suggest that at-school substance use is not an isolated event, but rather an important signal identifying teens in need of significant and urgent psychosocial support.

While boys and girls using substances at school had similar risk profiles overall, for both fighting and having been forced to have intercourse, the magnitude of the association was larger for boys than for girls. Previous studies have reported associations between fighting at school, weapon carrying at school, and at-school substance use[8]. However, although all of these behaviors are more prevalent in boys[3], there appears to be a true gender difference in

the strength of the association between fighting and at-school substance use. We also found a gender difference in the association between at-school substance use and having been forced to have intercourse. This is consistent with previous analyses of YRBS suggesting differences in factors associated with forced intercourse for boys versus girls[20-22]. Given the significant mental and physical morbidity associated with sexual trauma[23,24], identifying adolescents who have been victims of sexual violence and getting them into treatment is critical. This is particularly true for adolescent males for whom a history of sexual trauma may be under-reported and go unrecognized[25,26].

Overall, this study has important implications for how adults might respond to students who are found using substances at school. While at-school substance use might be viewed primarily as a disciplinary problem at many schools, and hence treated in similar fashion to other school infractions[27], this approach may not address students' needs and might even exacerbate risks by increasing social isolation. Identification of at-school use represents a critical opportunity to screen for other serious health issues and to ensure that students with exposure to trauma or underlying mental health needs are identified and referred for treatment. Additionally, clinicians screening for substance use in medical and community settings might ask any adolescent patients who disclose substance use about substance use on school campus. A positive response might clearly alert the clinician to more fully explore unmet mental health and behavioral health needs.

This study is limited by its cross-sectional nature; thus, we cannot comment on whether the serious health risks occurred before or after the onset of at-school substance use. Since our goal, however, was to determine whether at-school substance use is merely a useful marker of other serious health risks, establishing causality in this study was not an objective. Further, all data is self-reported and hence may not be entirely valid. However, surveys are anonymous to encourage honesty and previous studies of YRBS demonstrate that responses to questions regarding serious health risks have good test-re-test reliability.[28,29] The absence of contextual variables in the data set limit our ability to account for socio-economic status, family factors, academic performance and other potential confounders known to predict risky health behaviors. Our analysis was further limited by the items included in the survey, such as the use of only one question to identify symptoms of depression. Additionally, the multiple outcomes in our analysis increase the probability that significant findings might be due to chance alone. However, given both the fact that these outcomes are not independent and the strength and consistency of the findings, the probability of committing a type 1 error is low. Given the large sample size and nationally representative nature of the data set, these limitations are outweighed by the ability to examine differences in relatively rare outcomes by substance and gender and the generalizability of the findings.

Conclusion

In summary, we found that at-school alcohol and marijuana users had higher odds of exhibiting all 9 serious health risks, compared with out-of-school users. These findings were consistent across genders and type of substance used at school. The risks at-school users are more likely to exhibit have serious and immediate implications for adolescent health and may not be identified by adults in other settings. Thus, identification of at-school substance

use represents a critical opportunity to screen for and identify other serious health risks and to ensure that teens receive the appropriate psychosocial support to avoid serious morbidity and mortality.

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What's New

For boys and girls, using alcohol or marijuana at school is associated with numerous serious health risks that threaten adolescent health and safety. Students found using substances on campus should be carefully screened for unmet mental and behavioral health needs.

Table 1
Demographics and Self-Reported 30-day Substance Use

	Overall Sample	Substance Users
	Percent (N)	Percent (N)
Male	51.6% (7656)	53.4% (3296)
13 years and under	0.3% (68)	0.4% (34)
14 years old	11.7% (1561)	8.2% (457)
15 years old	24.7% (3470)	20.1% (1214)
16 years old	26.1% (4061)	27.6% (1793)
17 years old	23.8% (3921)	27.2% (1850)
18 and older	13.3% (2282)	16.5% (1117)
White	56.9% (6171)	57.9% (2623)
Black	14.2% (2767)	12.4% (1013)
Latino	9.2% (2227)	9.5% (998)
Multiracial	14.8% (3051)	16.1% (1397)
Other	5.0% (894)	4.2% (336)
No alcohol or marijuana use	55.4% (7779)	N/A
Out-of school use only	39.8% (5577)	90.5% (5577)
Alcohol only	21.6% (3052)	48.2% (3052)
Marijuana only	6.3% (984)	14.8% (984)
Alcohol & Marijuana	10.8% (1541)	25.2% (1541)
At-school use	8.9% (1469)	20.6% (1469)
Alcohol only	3.0% (522)	6.2% (522)
Marijuana only	3.7% (598)	8.0% (598)
Alcohol & Marijuana	2.1% (349)	5.1% (349)

Table 2

The Association Between At-School Substance Use, Gender, and Serious Health Risks Compared to Out-of-School Users

	Intoxicated Driving		Fighting		Weapon Carrying at school		Substance Use with Intercourse	
Type of User	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
At-school use	**2.60*****	**2.08 - 3.25**	**2.56*****	**1.98 - 3.31**	**8.17*****	**5.06 - 13.19**	**3.70*****	**2.74 - 4.99**
At-school use * male gender	1.23	0.87 - 1.73	**1.40***	**1.03 - 1.91**	0.66	0.40 - 1.09	1.35	0.98 - 1.86
Male gender	**0.84***	**0.71 - 0.99**	**2.11*****	**1.82 - 2.46**	**4.23*****	**2.86 – 6.24**	**1.23***	**1.04 – 1.47**

	Intimate Partner Violence		Forced to Have Intercourse		Symptoms of Depression		Suicidal Ideation		Attempted Suicide	
Type of User	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95 CI**	**OR**	**95% CI**
At-school use	**2.24*****	**1.66 - 3.01**	**2.56*****	**1.94 - 3.38**	**2.15*****	**1.61 - 2.86**	**2.21*****	**1.75 - 2.78**	**2.89*****	**2.21 - 3.79**
At-school use * male gender	1.13	0.79 - 1.61	**2.40*****	**1.52 - 3.79**	0.82	0.55 - 1.23	1.07	0.77 - 1.51	1.49	0.94 - 2.37
Male gender	0.86	0.68 - 1.10	**0.21*****	**0.15 - 0.29**	**0.42*****	**0.35 – 0.51**	**0.84*****	**0.49 - 0.65**	**0.44*****	**0.33 - 0.59**

* = P<.05,

** = P<.01,

*** = P<.001.

Reference group are out-of-school-users. Analysis controls for gender, race, and age.

Table 3

Association between at-school alcohol, marijuana, or alcohol/marijuana use and serious risk behaviors compared with out-of-school users

	Intoxicated Driving		Fighting		Weapon Carrying at school		Substance Use with Intercourse	
Type of At-School User	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Alcohol	**2.21*** **	**1.64 – 2.99**	**2.18*** **	**1.66 – 2.87**	**3.09*** **	**2.11 – 4.53**	**2.72*** **	**1.97 – 3.75**
Marijuana	**2.51*** **	**2.11 – 2.98**	**2.45*** **	**1.76 – 3.41**	**3.07*** **	**2.04 – 4.65**	**3.89*** **	**3.03 – 4.98**
Alcohol* Marijuana	1.08	0.70 – 1.67	**1.71***	**1.05 – 2.77**	**2.07***	**1.15 – 3.72**	0.89	0.57 – 1.38

	Intimate Partner Violence		Forced Intercourse		Symptoms of Depression		Suicidal Ideation		Attempted Suicide	
Type of At-School User	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95 CI**	**OR**	**95% CI**
Alcohol	**1.74****	**1.22 - 2.48**	**2.47*** **	**1.87 - 3.26**	**2.11*** **	**1.64 - 2.72**	**2.18*** **	**1.66 - 2.85**	**2.77*** **	**1.87 - 4.09**
Marijuana	**1.64****	**1.14 - 2.36**	**2.37*** **	**1.58 - 3.55**	**1.47****	**1.13 - 1.90**	**1.50****	**1.15 - 1.94**	**2.06*** **	**1.42 - 3.00**
Alcohol* Marijuana	1.74	0.95 - 3.18	1.43	0.74 - 2.76	0.82	0.51 - 1.31	1.27	0.77 - 2.08	1.22	0.68 - 2.17

* = P<.05,

** = P<.01,

*** = P<.001.

Reference group are out-of-school-users. Analysis controls for gender, race, and age.

Table 4

Sensitivity, Specificity, Positive and Negative Predictive Values of Substance Use Behaviors for Predicting Serious Health Risks

	Intoxicated Driving	Fighting	Weapon Carrying at School	Intimate Partner Violence	Substance Use with Intercourse	Forced to Have Intercourse	Symptoms of Depression	Suicidal Ideation	Attempted Suicide
No Alcohol or Marijuana Use									
Sensitivity	0.22	0.35	0.22	0.29	0.04	0.30	0.42	0.39	0.28
Specificity	0.33	0.35	0.43	0.42	0.39	0.43	0.39	0.41	0.42
Positive Predictive Value	0.10	0.21	0.02	0.05	0.01	0.04	0.21	0.13	0.04
Negative Predictive Value	0.55	0.53	0.91	0.86	0.79	0.88	0.63	0.74	0.88
Out-of-School Alcohol or Marijuana Use									
Sensitivity	0.67	0.55	0.51	0.56	0.78	0.54	0.50	0.50	0.55
Specificity	0.70	0.67	0.61	0.62	0.64	0.61	0.64	0.63	0.61
Positive Predictive Value	0.43	0.56	0.07	0.12	0.19	0.10	0.35	0.24	0.10
Negative Predictive Value	0.86	0.76	0.96	0.93	0.97	0.94	0.77	0.85	0.95
At-School Alcohol or Marijuana Use									
Sensitivity	0.22	0.19	0.41	0.24	0.37	0.26	0.15	0.18	0.29
Specificity	0.96	0.96	0.93	0.93	0.94	0.93	0.93	0.93	0.93
Positive Predictive Value	0.64	0.69	0.25	0.25	0.41	0.23	0.46	0.38	0.25
Negative Predictive Value	0.78	0.71	0.97	0.92	0.93	0.94	0.74	0.83	0.94
At-School Alcohol or Marijuana Use									
Sensitivity	0.07	0.05	0.21	0.09	0.13	0.10	0.04	0.06	0.10
Specificity	0.99	1.0	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Positive Predictive Value	0.78	0.88	0.48	0.40	0.59	0.37	0.52	0.48	0.39
Negative Predictive Value	0.75	0.69	0.96	0.91	0.92	0.93	0.72	0.82	0.93